July 11, 2006

Mr. John Glass
South Carolina Department of Health and Environmental Control
Bureau of Air Quality
2600 Bull Street
Columbia, SC 29201

RE: Air dispersion modeling protocol for Santee Cooper – Florence County, SC
Permit No. 1040-01131

Dear Mr. Glass:

South Carolina Public Service Authority, also known as Santee Cooper, is planning to construct a new coal-fired power plant located near Kingsburg, South Carolina. The plant, referred to as the Pee Dee facility, would consist of combustion boiler technology and ancillary equipment to produce steam for the generation of electricity. The scope of the project will require an air quality permit issued under the Prevention of Significant Deterioration (PSD) permitting rules as facility emissions exceed the major source threshold for several PSD pollutants. A PSD construction permit application was submitted to the South Carolina Department of Health and Environmental Control (DHEC) on May 31, 2006. In support of the PSD permit application, Santee Cooper has contracted with Trinity Consultants (Trinity) to conduct the necessary dispersion modeling analyses.

Following DHEC policy, Trinity has prepared this dispersion modeling protocol prior to completing the air quality analyses. The protocol outlines the methodologies that will be employed in these analyses, including the proposed dispersion models, meteorological data, and procedures for treating building downwash, selecting receptor grids, and accounting for terrain. The protocol is submitted for your review and approval.

PROJECT DESCRIPTION

Santee Cooper proposes to construct two pulverized coal boilers at the Pee Dee facility. An area map depicting the area surrounding the facility is included as Figure A-1. The boilers will nominally provide 660 MW of power each. They will be identical pulverized coal-fired boilers each with a nominal heat input capacity of 5,700 MMBtu/hr. Steam produced by each boiler will feed a steam turbine generator. Power produced by the steam generators will be sold to the grid.

The proposed project also calls for construction of two 1,500 kW diesel-fired emergency generators, a 380 hp fire pump, a 215 MMBtu/hr auxiliary boiler, two multi-cell cooling towers (one for each new boiler), multiple storage tanks, and coal, petcoke, limestone, and solid waste handling equipment. Figures A-2 and A-3 include a building and emission point layout.

Per DHEC's *Updated Standard 2 and 7 Exemption and Deferral Guidelines*[1], Trinity proposes to exclude emissions from the emergency generators and fire pump from as these units will operate less than 500 hours per year.

The cooling towers and material handling sources that exceed the DHEC exemption thresholds (> one lb/hr uncontrolled) will also be included in the modeling analyses despite the fact that the emissions from these sources are expected to be very low and the majority of the emissions will be fugitive in nature. A complete list of modeled sources and modeled emissions is included in Table 1 and Table 2, respectively.[2]

Trinity proposes to exclude the following sources since each has an uncontrolled emission rate below one lb/hr (emission rates are included in Table A-1):

- Gypsum Material Transfer Sources
  - Conveyor to stockout
  - Truck loading
- Petcoke Storage Pile
- Bottom Ash Transfer Point
- Limestone Storage Pile
- Limestone Material Transfer Sources
  - Truck unloading to limestone pile
  - Emergency limestone reclaim hopper loading
  - Limestone platform conveyor drop to crusher feed conveyor
  - Emergency limestone reclaim hopper drop to emergency reclaim conveyor
  - Limestone drop to crusher house and overland conveyors
  - Limestone emergency reclaim conveyor drop to overland conveyors
  - Limestone overland conveyor drop to cross conveyor
  - Limestone cross conveyor drop to Limestone Silo #1
  - Limestone overland conveyor drop to Limestone Silo #2

Trinity also proposes to exclude the following sources which will operate less than 500 hours per year:

- Emergency Generator No. 1
- Emergency Generator No. 2
- Fire Pump

[1] http://www.scdhec.gov/eqc/baq/pubs/Standard2and7ModelingExemptionandDeferralGuidelines.doc

[2] Note that modeled emission rates for the boilers differ slightly from potential emissions. Please refer to the permit application report for additional details.

TABLE 1. MODELED SOURCE LIST

Source Type	Unit ID	Description
Utility Boilers	B01	Boiler No. 1
	B02	Boiler No. 2
Auxiliary Boiler	AB01	Auxiliary Boiler
Material Transfer		Material Transfer - Coal
	MT01	Rotary Railcar Dumper
	MT02	Conveyor Transfer to Stacker/Reclaim
	MT03	Emergency Stockout drop to Pile
	MT04	Transfer Tower Conveyors
	MT05	Emergency Reclaim
	MT06	Dumper to Sample/Transfer Tower
	MT07	Sample/Transfer Tower
	MT08	Stacker/Reclaimer Stockout
	MT09	Stacker/Reclaimer Reclaim
	MT10	Conveyor to Crusher Tower
	MT11	Conveyor to Transfer Tower
	S01-S12	Silos (12 total)
		Material Transfer - Pet Coke
	MT13	Front end loading
	MT14	Hopper loading
	MT15	Conveyor Transfer
		Material Transfer - Fly Ash
	MT16	Truck loadout 1
	MT17	Truck loadout 2
	MT18	Silo 1
	MT19	Silo 2
Crusher	CR01	Coal Crusher
	CR02	Limestone Crusher
Storage Piles	ST01	Gypsum Storage Pile
	ST02	Coal Storage Pile
Cooling Towers	CT01A-CT02L	Cooling Towers

TABLE 2. MODELED FACILITY EMISSIONS

Unit ID	PM_{10} (lb/hr)	NO_x (lb/hr)	SO_x (lb/hr)	CO (lb/hr)
B01	102.60	342.00	627.00	912.00
B02	102.60	342.00	627.00	912.00
AB01	5.38	21.50	11.18	67.06
MT01	0.01	-	-	-
MT02	0.01	-	-	-
MT03	0.82	-	-	-
MT04	0.01	-	-	-
MT05	0.01	-	-	-
MT06	0.01	-	-	-
MT07	0.01	-	-	-
MT08	0.82	-	-	-
MT09	0.01	-	-	-
MT10	0.82	-	-	-
MT11	0.01	-	-	-
S01-S12	0.10	-	-	-
MT13	0.82	-	-	-
MT14	0.82	-	-	-
MT15	0.01	-	-	-
MT16	0.01	-	-	-
MT17	0.01	-	-	-
MT18	0.01	-	-	-
MT19	0.01	-	-	-
ST01	0.99	-	-	-
ST02	1.10	-	-	-
CR01	0.23	-	-	-
CR02	0.02	-	-	-
CT01A-CT02L	9.32	-	-	-

Emissions from the proposed project may potentially impact the Cape Romain National Wildlife Refuge, a Class I area located approximately 100 km from the Pee Dee facility. The Class I Increment analysis, which is required by the PSD program, was addressed in a separate modeling protocol submitted with the Air Quality Related Value (AQRV) analyses protocol.[3]

PSD APPLICABILITY

The Pee Dee facility is located in Florence County, which has been designated by the U.S. EPA as "attainment" or "unclassifiable" for all criteria pollutants. As such, PSD regulations apply to any new major stationary source or major modifications to an existing major stationary source. A stationary source is considered "major" if it has the potential to emit either (1) 100 tons per year or more of a regulated pollutant if the source is classified as one of 28 designated industrial source categories, or (2) 250 tons per year or more of any regulated pollutant for unlisted sources. The Pee Dee facility is included in the listed industrial categories because it is a

[3] Protocol submitted to FWS and DHEC on March 17, 2006.

fossil-fuel fired steam electric plant with heat input capacity greater than 250 MMBtu/hr. Potential emissions of oxides of nitrogen (NO_x), carbon monoxide (CO), particulate matter less than 10 micrometers aerodynamic diameter (PM_{10}), sulfur dioxide (SO_2), and volatile organic compounds (VOC) will be greater than 100 tons per year. Therefore, the Pee Dee facility will be a new PSD major stationary source and PSD review, including dispersion modeling, will be required for the proposed project.

CLASS II MODELING REQUIREMENTS

Attachment 2 illustrates the steps that will be taken in completing the required Class II PSD air quality analysis for this permit action. The techniques proposed for this analysis are consistent with current U.S. EPA policy[4] and South Carolina DHEC Guidelines.[5,6]

LOAD MODELING ANALYSIS

The *Guideline on Air Quality Models* states that modeling should contain sufficient detail to determine the maximum ambient concentration of the pollutant under consideration, and that this will likely involve modeling several operating loads or production rates. For some types of sources, operating at a reduced load translates into reduced stack gas exit velocities leading to different and potentially higher impact characteristics. This situation is not expected to apply to the proposed coal-fired boilers since the impact of reducing emissions will overshadow the impact of decreasing exhaust flowrate or temperature with decreasing load.

SIGNIFICANCE ANALYSIS

Initially, a Significance Analysis was completed to determine if the emissions increases at the Pee Dee facility will result in a significant impact upon the area surrounding the facility. Maximum ground-level concentrations for each pollutant and averaging period were compared to the U.S. EPA-established Class II Modeling Significance Levels (MSL) provided in Table 3. If a significant impact (i.e., an ambient impact above the applicable MSL) does not result, no further modeling analysis will be completed for that pollutant. If a significant impact does result, further refined modeling will be completed to determine whether the proposed project will cause or contribute to a violation of the National Ambient Air Quality Standards (NAAQS) or consume more than the available Class II Increment.

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[4] 40 CFR 51, Appendix W, *Guideline on Air Quality Models*.

[5] South Carolina DHEC, *Air Quality Modeling Guidelines* (July 2001).

[6] http://www.scdhec.gov/eqc/baq/pubs/Standard2and7ModelingExemptionandDeferralGuidelines.doc

TABLE 3. CLASS II MODELING SIGNIFICANCE LEVELS

Pollutant	Averaging Period	MSL ($\mu g/m^3$)
CO	1-hour	2,000
	8-hour	500
SO_2	3-Hour	25
	24-Hour	5
	Annual	1
NO_2	Annual	1
PM_{10}	24-Hour	5
	Annual	1

The Significance Analysis was limited to PM_{10}, NO_x, SO_2, and CO. Ambient impacts of total suspended particulate (TSP), fluorides, lead (Pb) and sulfate (H_2SO_4) associated with the proposed project will also be assessed; however, no MSL exists for these pollutants. Modeling of VOC emissions using reactive plume modeling to estimate ozone impacts is rarely conducted on a source-by-source basis in the Southeast, as the region is generally NO_x limited with regard to ozone formation. Further, South Carolina DHEC has historically not required any assessment of VOC ambient impacts in PSD air quality analyses. Thus, no modeling will be conducted to evaluate potential impacts on ambient ozone.

The significance analysis will also be used to demonstrate compliance with South Carolina Standard 2 (Ambient Air Quality Standards) and Standard 7 (PSD). The Standard 2 analysis will also include appropriate background concentrations.

Table 4 includes the results of the significance analysis. NO_X, PM_{10}, and SO_2 have significant impacts. Therefore, NAAQS and Increment modeling will be conducted for these pollutants.

TABLE 4. SIGNIFICANCE ANALYSIS RESULTS

Pollutant	Avg. Period	Max Impact (µg/m3)	Sig. Level (µg/m3)	Exceeds?	SIA (km)
SO_2	3-Hour	35.5	25	yes	2.1
	24-Hour	14.5	5	yes	7.0
	Annual	1.7	1	yes	3.2
PM_{10}	24-Hour	25.3	5	yes	2.0
	Annual	5.0	1	yes	2.4
NOx	Annual	1.6	1	yes	2.3
CO	1-Hour	122.1	2,000	no	N/A
	8-Hour	47.7	500	no	N/A

AMBIENT MONITORING REQUIREMENTS

Under current U.S. EPA policies, the maximum impacts due to the emissions increases from a project are also assessed against monitoring *de minimis* levels to determine whether pre-

construction monitoring should be considered. If either the predicted modeled impact from an emission increase or the existing ambient concentration is less than the monitoring *de minimis* concentration, the permitting agency has the discretionary authority to exempt an applicant from pre-construction ambient monitoring.

Ambient monitoring data representative of the area surrounding the Pee Dee facility are available from existing monitoring stations. To satisfy the PSD pre-construction monitoring requirements, Trinity presumes that data from South Carolina DHEC-run monitoring stations already in place within the state provide reasonable estimates of the background concentrations of all pollutants of concern. Further, Trinity will add background concentrations provided by South Carolina DHEC to pollutant impacts predicted in the modeling analysis conducted to demonstrate compliance with the NAAQS. Accordingly, Trinity proposes that pre-construction monitoring not be required for this project. Based on a review of ambient monitoring data, the values in Table 5 are proposed as representative background concentrations. In response to this protocol, Trinity requests that DHEC confirm that these values are appropriate.

TABLE 5. PROPOSED BACKGROUND CONCENTRATIONS

	UTM	UTM		TSP	CO		SO_2			NO_X	PM_{10}	
	East	North	Distance	Annual	1-Hour	8-Hour	3-Hour	24-Hour	Annual	Annual	24-Hour	Annual
Site Name	(km)	(km)	(km)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)
H L Sneed Middle School	606.0	3,781.1	42.4	10.1								
Winyah	659.5	3,693.9	64.2								48.0	21.2
Georgetown CMS	658.7	3,692.5	65.2				102.1	20.9	5.0			
Cape Romain	625.5	3,645.5	110.1		3,893.0	801.5						
Boyer	551.9	3,684.4	112.1							8.3		

AMBIENT RATIO METHOD FOR NO_X

The so-called Ambient Ratio Method (ARM) has evolved from previous representations (e.g., Ozone Limiting Method) of the oxidation of nitric oxide (NO) by ambient ozone and other photochemical oxidants. The ARM is a *Guideline* approach contained in Section 6.2.3, *Models for Nitrogen Dioxide (Annual Average)*, of 40 CFR Part 51, Appendix W. The *Guideline* provides that:

> a. *A tiered screening approach is recommended to obtain annual average estimates of NO_2 from point sources for New Source Review analysis, including PSD…. For Tier 1 … use an appropriate Gaussian model to estimate the maximum annual average concentration and assume a total conversion of NO to NO_2. If the concentration exceeds the NAAQS and/or PSD increments for NO_2, proceed to the 2nd level screen.*
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> b. *For Tier 2 (2nd level) screening analysis, multiply the Tier 1 estimate(s) by an empirically derived NO_2/NO_x value of 0.75 (annual national default). An annual NO_2/NO_x ratio differing from 0.75 may be used if it can be shown that such a ratio is based on data likely to be representative of the location where maximum annual impact occurs from the individual source under review occurs. In the case where several sources contribute to consumption of PSD increment, a locally derived annual NO_2/NO_x ratio should also be*

shown to be representative of the location where the maximum collective impact from the new plus existing sources occurs.

Trinity will utilize the ARM at the Tier-2 default ratio of 75% NO_2/NO_X for the NAAQS and PSD Increment modeling analyses, only in the event that compliance cannot be demonstrated without its use. Trinity requests that South Carolina DHEC indicate whether ambient data suggests that a value other than the 75% default should be used to estimate impacts in the area surrounding the Pee Dee facility, should use of the ARM be necessary.

REGIONAL SOURCE INVENTORIES

For off-site pollutant impacts calculated in the Significance Analysis that exceeded the applicable Class II MSL, a Significant Impact Area (SIA) was determined for each pollutant for which an exceedance is predicted. The SIA encompasses a circle centered on the Pee Dee facility with a radius extending out to either (1) the farthest location where the predicted ambient impact of a pollutant from the project exceeds the Class II MSL, or (2) a distance of 50 km, whichever is less. All sources within a distance of 50 km of the edge of a SIA are assumed to potentially contribute to ground-level concentrations within the SIA and will be evaluated for possible inclusion in the NAAQS and PSD Increment analyses.

As shown in Table 4, the SIA is 2.3 km, 2.4 km and 7.0 km for NO_X, PM_{10}, and SO_2, respectively. A regional source inventory will be compiled for NO_X, PM_{10}, and SO_2 for NAAQS and PSD Increment analyses. Source location, stack parameters, and potential emissions data were obtained from South Carolina DHEC.[7] Trinity will compile these data and calculate the distance of each source from the Pee Dee facility. To conservatively include sources, all sources less than 50 km from the facility will be included and sources between 50 and 65 km distant will be included based on the "20D" rule.[8] Using this procedure, sources outside the area of significant impact are excluded from the inventory if the entire facility's emissions (tpy) are less than 20 times the distance (km) from the facility to the nearest edge of the SIA.

NAAQS ANALYSIS

For NO_X, PM_{10}, and SO_2 a NAAQS analysis is required. The NAAQS analysis will include the potential emissions from all proposed emission units at the Pee Dee facility. Impacts attributable to facility-wide emissions will then be combined with the impacts attributable to the regional source inventory. The resulting impacts, added to appropriate background concentrations, will be assessed against the applicable NAAQS to demonstrate compliance. For the annual average NO_2, PM_{10}, and SO_2 NAAQS, the highest modeled concentration among five consecutive years of meteorological data will be assessed. For the short-term PM_{10}, and SO_2 standards, high-second-high concentrations will be calculated and compared.

CLASS II PSD INCREMENT ANALYSIS

The PSD Increments were established to "prevent deterioration" of air quality in certain areas of the country where air quality was better than the NAAQS. To achieve this goal, U.S. EPA

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[7] Sources in North Carolina were reviewed and none are located less than 65 km from the facility.

[8] Federal Register, Volume 57, No. 45, March 6, 1992, p. 8079.

established PSD Increments for certain pollutants. The sum of the PSD Increment concentration and a baseline concentration defines a "reduced" ambient standard, either lower than or equal to the NAAQS that must be met in an attainment area. U.S. EPA has established PSD Increments for PM_{10}, NO_x, and SO_2. There are no PSD Increments established for CO, and thus, CO is not included in this analysis.

To demonstrate compliance with the Class II PSD Increments, the Increment-affecting emissions from the Pee Dee facility and those from sources in the regional inventory will be modeled. For short-term averaging periods, the highest-second-high incremental impact will be compared to the applicable PSD Increment to assess compliance. For annual average standards the highest incremental impact will be assessed.

The determination of whether an emissions change at a given source consumes or expands Increment is based on the source definition and the time the change occurs in relation to baseline dates. The major source baseline date for PM_{10} and SO_2, is January 6, 1975.[9] The major source baseline date for NO_X is February 9, 1988. Emission changes at major sources that occur after the major source baseline date affect Increment. In contrast, emission changes at minor sources only affect Increment after the minor source baseline date, which is set at the time when the first PSD application is completed in a given area, usually arranged on a county-by-county basis. Per the South Carolina DHEC website, the minor source baseline date in Florence County is September 28, 1978 for PM_{10} and SO_2. Thus, any regional source inventory will need to include minor sources for PM_{10} and SO_2.

The inventory provided to Trinity by DHEC includes any increment affecting minor sources. Because the proposed sources at the Pee Dee facility will be constructed after the applicable baseline date, all potential emissions from the Pee Dee facility affect the available Increment. For pre-baseline sources that have been shut down (i.e., Increment expanders), a negative number representative of the actual emission rate at the time the unit was shut down will be incorporated into the model runs. Stack parameters used for the Increment expanders will also be those in existence at the time the units were retired.

MODEL SELECTION AND METHODOLOGY

SELECTION OF MODEL

Two levels of air quality dispersion models exist: screening and refined dispersion modeling. Normally, screening modeling is performed to determine the need for refined modeling. When results from a screening model indicate potentially adverse impacts, a refined modeling analysis is performed. A refined modeling analysis can provide a more accurate estimate of a source's impact and requires more detailed and precise input data than does a screening model. Due to the likelihood that a screening model would result in requirements for further modeling, refined models will be used in the modeling analysis for this PSD permit application unless otherwise stated.

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[9] January 6, 1975, is the major source baseline data for particulate matter; however, South Carolina DHEC does not track Increment consumption for Total Suspended Particulate Matter and only PM_{10} Increment consumption is currently evaluated. For this analysis, PM_{10} emission changes at major sources that occurred after January 6, 1975, are assumed to affect the available PM_{10} Increment.

The latest version (04300) of the AERMOD model will be used to estimate maximum ground-level concentrations in all air pollutant analyses conducted for this application. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and was promulgated in December 2005 as the preferred model to use for industrial sources in this type of air quality analysis.[10] Following procedures outlined in the *Guideline on Air Quality Models*, the AERMOD modeling will be performed using the regulatory default option. The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as input will be determined by the Building Profile Input Program, PRIME version (BPIP PRIME), version 04274.[11]

TREATMENT OF TERRAIN

Complex terrain is defined as any terrain elevation exceeding stacktop height. Complex terrain is further sub-categorized into intermediate terrain (terrain elevation less than final plume rise height) and true complex terrain (terrain elevation greater than final plume rise height). The AERMOD model simplifies the treatment of terrain, as it does not have different algorithms for varying source-receptor elevation relationships described above. Through the use of the AERMOD terrain preprocessor (AERMAP), AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor that could lead to plume recirculation and other terrain interaction.[12]

Receptor terrain elevations input to the model will be those interpolated from Digital Elevation Model (DEM) data obtained from the U.S. Geological Survey (USGS). DEM data consist of arrays of regularly spaced elevations and correspond to the 1:24,000 scale topographic quadrangle map series. The array elevations are at 30-meter intervals and will be interpolated using Trinity's *BREEZE®-AIR* software to determine elevations at the defined receptor intervals. All data obtained from the DEM files will be checked for completeness and spot-checked for accuracy against elevations on corresponding USGS 1:24,000 scale topographical quadrangle maps. Missing or erroneous data from the DEM files will be replaced by direct interpolation from the DEM data.

METEOROLOGICAL DATA

Per the South Carolina DHEC's July 2001 *Air Quality Modeling Guidelines*, all analyses will be performed using 1987 through 1991 preprocessed meteorological data based on surface observations taken from Columbia, South Carolina (Station No. 13883), and upper air observations from Athens, GA (Station No. 13873).[13] The height of the meteorological profile

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[10] 40 CFR 51, Appendix W–*Guideline on Air Quality Models*, Appendix A.1– AMS/EPA Regulatory Model (AERMOD).

[11] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model,* Concord, MA.

[12] US EPA, *Users Guide for the AERMOD Terrain Preprocessor (AERMAP)*, EPA-454/B-03-003, Research Triangle Park, NC

[13] South Carolina DHEC, *Air Quality Modeling Guidelines* (July 2001), Section 5.2.1.1.

base (met station elevation above sea-level, used in computation of the potential temperature) is listed on the National Climatic Data Center (NCDC) website as 64.9 meters.[14] The meteorological data set suitable for use with AERMOD was obtained from the South Carolina dispersion modeling website.[15]

RECEPTOR GRIDS

In the Class II air dispersion modeling analyses, ground-level concentrations will be calculated within two Cartesian receptor grids. The Cartesian grid will cover a region at a minimum extending from all edges of the Pee Dee facility boundary past where impacts from the proposed project are no longer significant. The initial grids for significance modeling will contain 100-meter spaced receptors extending approximately 5 km from the source and 500-meter spaced receptors extending from 5-10 km. Due to the long run-times associated with AERMOD as compared to ISC, the number of receptors was minimized. In addition, receptors are placed 50 m apart along the fenceline. A plot of receptor locations and elevations is provided in Figure A-4.

LAND USE ANALYSIS

AERMOD meteorological data include landuse specific parameters. When processing the datasets in the preprocessing program, AERMET, the user must supply values for the albedo, Bowen ratio, and surface roughness. Each of these values varies with differing landuse and has an effect on the meteorological data that is used in AERMOD (especially the surface roughness length). Therefore, it is important to ensure that the landuse regime surrounding the meteorological data collection site is representative of the landuse surrounding the project site. Per conversation with South Carolina DHEC,[16] the landuse between the Pee Dee site and the Columbia data collection site are appropriately similar and thus the meteorological data from Columbia constitute representative data. Figure A-5 shows a landuse plot containing both the Columbia and Pee Dee sites.

BUILDING DOWNWASH

The emission units at the Pee Dee facility will be evaluated in terms of their proximity to nearby structures. The purpose of this evaluation will be to determine if stack discharges might become caught in the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. The current version of the AERMOD dispersion model treats building wake effects following the algorithms developed by Schulman and Scire.[17] This approach requires the modeler to input wind direction-specific building dimensions for structures located within 5*L* of

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[14] Note that the DHEC website lists the base elevation as 245 feet (74.7 m). However, this appears to be the base elevation plus the anemometer height.

[15] South Carolina DHEC website: http://www.scdhec.net/eqc/baq/html/modeling.html

[16] Personal communication between Mr. Paul Martin (DHEC) and Ms. Maria Zufall (Trinity), December 15, 2005.

[17] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model,* Concord, MA.

a stack, where *L* is the lesser of the height or projected width of a nearby structure. Stacks taller than the structure height plus 1.5*L* are not subject to the effects of downwash in the AERMOD model.

For these modeling analyses, the direction-specific building dimensions used as input to the AERMOD model will be calculated using the *BREEZE®-AIR* software, developed by Trinity. This software incorporates the algorithms of the U.S. EPA sanctioned Building Profile Input Program, PRIME version (BPIP PRIME), version 04274.[13] BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents.[18]

Output from the BPIP PRIME downwash analysis will be provided in the permit application for review by DHEC. This output will list the names and dimensions of the structures considered and the emissions unit locations and heights. The output will also contain a summary of the dominant structure for each emissions unit and the actual building height and projected widths for all wind directions. Building downwash will not be considered for any regional sources for the NAAQS or PSD Increment analyses.

REPRESENTATION OF EMISSION SOURCES

COORDINATE SYSTEM

In all modeling analyses input and output files, the location of emission sources, structures, and receptors will be represented in the Universal Transverse Mercator (UTM) coordinate system. The UTM grid divides the world into coordinates that are measured in north meters (measured from the equator) and east meters (measured from the central meridian of a particular zone, which is set at 500 km). The central location of the Pee Dee facility is approximately 639 km East and 3,754 km North in Zone 17.

Because the area of the Pee Dee facility where structures and emissions units are located is flat, a single base elevation will be used in the model data files for all facility sources. The base elevation for the facility is approximately 62 feet (19 meters) above mean sea level.

SOURCE TYPES

The AERMOD dispersion model allows for emissions units to be represented as point, area, or volume sources. For point sources with unobstructed vertical releases, it is appropriate to use actual stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) in the modeling analyses. The Pee Dee boiler emission units will be modeled as point sources using actual stack parameters. The ancillary sources at the facility (storage piles, material handling sources, and cooling towers) will be represented as a combination of point and volume source emissions. Tables 6 and 7 detail source parameters for point and volume sources, respectively.

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[18] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised),* Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

TABLE 6. POINT SOURCE LIST

Unit	Unit ID	Stack Diameter (ft)	Stack Diameter (m)	Stack Height (ft)	Stack Height (m)	Stack Velocity (ft/s)	Stack Velocity (m/s)	Temperature °F	Temperature (K)
Main Boilers	B01-02	25.00	7.62	650	198.1	60.00	18.29	122.00	323.15
Auxiliary Boiler	AB01	4.76	1.45	100	30.5	49.21	15.00	300.00	422.04
Coal Silo Baghouse	S01-S12	10.00	3.05	170	51.8	2.86	0.87	Ambient	
Coal-Petcoke Crusher	CR01	5.00	1.52	30	9.1	10.31	3.14	Ambient	
Limestone Crusher	CR02	5.00	1.52	30	9.1	10.31	3.14	Ambient	
Cooling Tower	CT01-CT24	3.00	0.91	146	44.5	24.40	7.44	Ambient	

TABLE 7. VOLUME SOURCE LIST

	Unit ID	Release Height (ft)	Release Height (m)	Length of Side (ft)	Length of Side (m)
Coal Material Handling					
Rotary Railcar Dumper	MT01	10.0	3.0	4	1.2
Conveyor Transfer to Stacker/Reclaim	MT02	30.0	9.1	4	1.2
Emergency Stockout drop to Pile	MT03	30.0	9.1	4	1.2
Transfer Tower Conveyors	MT04	80.0	24.4	4	1.2
Emergency Reclaim	MT05	30.0	9.1	4	1.2
Dumper to Sample/Transfer Tower	MT06	80.0	24.4	4	1.2
Sample/Transfer Tower	MT07	80.0	24.4	4	1.2
Stacker/Reclaimer Stockout	MT08	30.0	9.1	4	1.2
Stacker/Reclaimer Reclaim	MT09	30.0	9.1	4	1.2
Conveyor to Crusher Tower	MT10	80.0	24.4	4	1.2
Conveyor to Transfer Tower	MT11	80.0	24.4	4	1.2
Pet Coke Material Handling					
Front end loading	MT13	5.0	1.5	4	1.2
Hopper loading	MT14	5.0	1.5	4	1.2
Conveyor Transfer	MT15	5.0	1.5	4	1.2
Fly Ash Material Handling					
Truck loadout 1	MT16	5.0	1.5	4	1.2
Truck loadout 2	MT17	5.0	1.5	4	1.2
Silo 1	MT18	80.0	24.4	4	1.2
Silo 2	MT19	80.0	24.4	4	1.2
Gypsum Storage Pile	ST01	30.0	9.1	489	149
Coal Storage Pile	ST02	30.0	9.1	1,662	507

GEP STACK HEIGHT ANALYSIS

The U.S. EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. The GEP height of a stack is the greater of (1) 65 meters (measured from the base elevation of the stack) and (2) the value returned from the following equation: [19]

$$H_g = H + 1.5 * (L)$$

[19] 40 CFR 51.100(ii).

where H_g = GEP stack height
H = height of nearby structure
L = lesser dimension, height or projected width, of nearby structure

Under the regulations, that portion of a stack that is in excess of the GEP stack height is generally not creditable when modeling to determine source impacts, preventing the use of excessively tall stacks to reduce ground-level pollutant concentrations. A GEP analysis was conducted for each stack included in these modeling analyses. Stacks that are found to have a release height in excess of GEP will be modeled at the GEP release height. Stacks that have a release height lower than their GEP value will be modeled at their actual release height. The dominant downwash structures at the Pee Dee Facility are the boiler buildings which both have a height of 275 feet. Based on the GEP formula above, that equates to a GEP height for the boiler stack of 687.5 feet. The actual stack height is 650 feet, which is below the GEP value and thus the boiler stacks will be modeled at the actual release height.

ADDITIONAL IMPACTS ANALYSIS

PSD regulations require that three additional impact analyses be performed as part of a PSD permit action. These are a growth analysis, a soil and vegetation analysis, and a visibility analysis. The effect of the proposed project's PM_{10}, NO_x, SO_2, and CO emissions on local soils and vegetation will be addressed through comparison of modeled impacts to secondary NAAQS (or primary NAAQS in the case of CO). The secondary NAAQS have been established to protect general public welfare and the environment. The presumption will be made in the PSD application that modeled impacts below the secondary NAAQS will indicate no adverse impacts on soil and vegetation.

Trinity asserts that no quantitative analysis of growth impacts is warranted for this project. Any workforce growth and associated residential and commercial growth that would be associated with this project will not cause a quantifiable impact on the air quality of the area surrounding the Pee Dee facility. Visibility impacts on Class I areas will be addressed through the AQRV analyses. U.S. EPA Region IV has recently requested visibility analyses for Class II areas of interest in addition to any Class I visibility analyses. Trinity has determined that Lake City Municipal Airport is the closest sensitive visibility receptor (27 km from the Pee Dee site). VISCREEN will be used to evaluate plume blight at Lake City. Please confirm if such an analysis is required by DHEC.

ADDITIONAL SOUTH CAROLINA STATE REQUIREMENTS

In addition to federal modeling requirements, South Carolina has state-only requirements. Standards 2 and 7 were addressed in previous sections of this protocol.

The state of South Carolina regulates the emissions of toxic air pollutants (TAP) via South Carolina Regulation 62.5, Standard 8, *Toxic Air Pollutants*. As noted in Standard 8, toxic air pollutant modeling is not required for sources burning only virgin fuel. As such, modeling is not required to show compliance with Standard 8.

APPROVAL OF MODELING PROTOCOL

Trinity is supplying this written document so that you can formally comment on and approve the methodologies to be used for these modeling analyses. Please provide a written response to this protocol to provide comments for our project record at your earliest convenience.

If you have any questions or comments about the information presented in this letter, please do not hesitate to call Kevin Clark of Santee Cooper at (843) 761-8000 ext. 5193 or me at (404) 256-1919.

Sincerely,

Maria Zufall, PhD
Senior Consultant

Attachments
P:\P01\01-073\DOCS\PROTOCOL.DOC

cc: Mr. Jay Hudson, Santee Cooper (Moncks Corner, SC)
Mr. Kevin Clark, Santee Cooper (Moncks Corner, SC)
Ms. Julie Metts, Santee Cooper (Moncks Corner, SC)
Mr. Russell Bailey, Trinity Consultants, (Atlanta, GA)

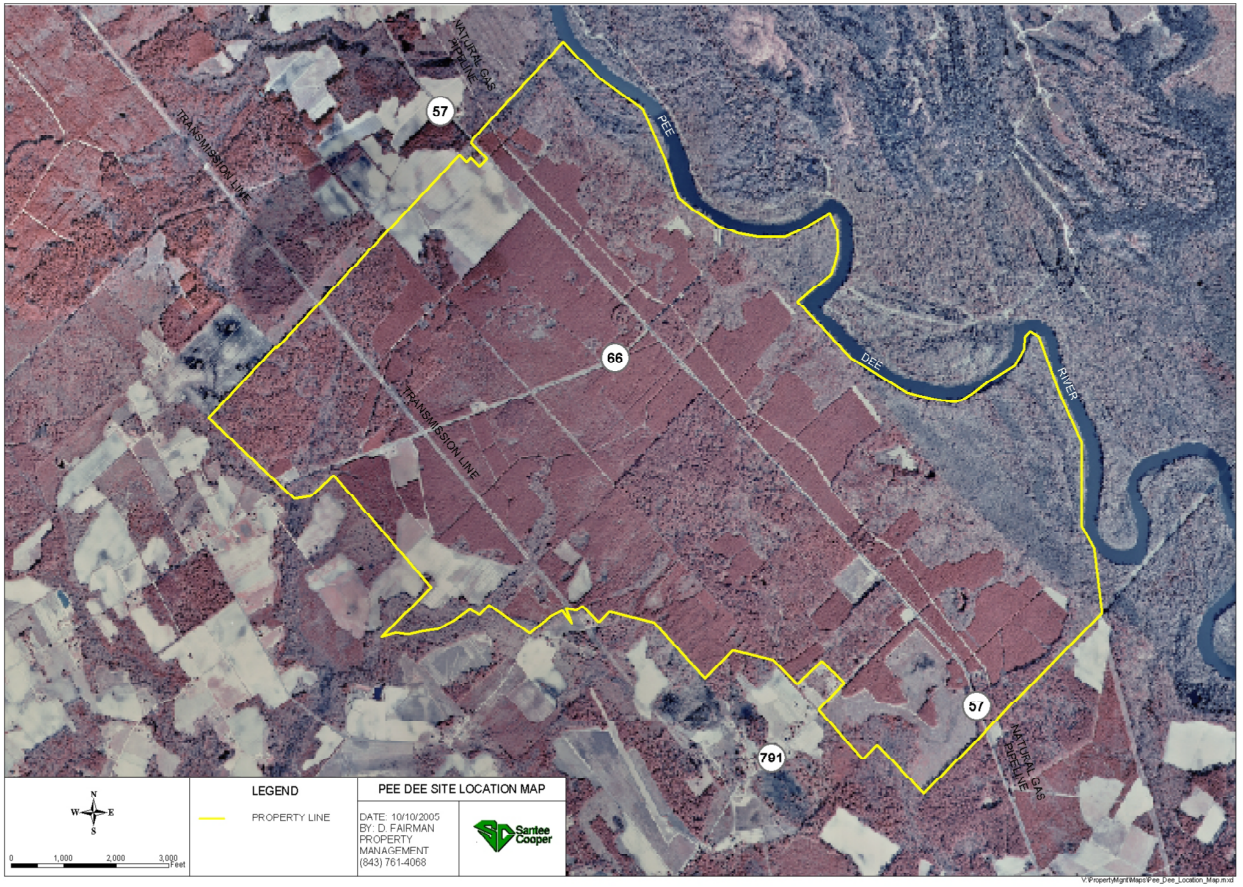
ATTACHMENT 1

Supporting Tables and Figures

Criteria Pollutant Modeling Emissions Summary

Source Type	Description	Uncontrolled PM (lb/hr)	PM (lb/hr)	PM_{10} (lb/hr)	$PM_{2.5}$ (lb/hr)	NOx (lb/hr)	SOx (lb/hr)	CO (lb/hr)	Model?
Utility Boilers	Boiler No. 1	102.60	102.60	102.60	102.60	399.00	855.00	912.00	Yes
	Boiler No. 2	102.60	102.60	102.60	102.60	399.00	855.00	912.00	Yes
	Main Boiler Total (24-hour average)	205.20	205.20	205.20	205.20	684.00	1,254.00	1,824.00	Yes
Auxiliary Boiler	Auxiliary Boiler	5.38	5.38	5.38	5.38	21.50	11.18	67.06	Yes
Fire Pump	Fire Pump			Operates less than 500 hrs/year					No
Generator	Generator No. 1			Operates less than 500 hrs/year					No
	Generator No. 2								
Material Transfer	Material Transfer - Coal								
	Rotary Railcar Dumper	1.73	0.02	0.01	0.00				Yes
	Conveyor Transfer to Stacker/Reclaim	1.73	0.02	0.01	0.00				Yes
	Emergency Stockout drop to Pile	1.73	1.73	0.82	0.12				Yes
	Transfer Tower Conveyors	1.73	0.02	0.01	0.00				Yes
	Emergency Reclaim	1.73	0.02	0.01	0.00				Yes
	Dumper to Sample/Transfer Tower	1.73	0.02	0.01	0.00				Yes
	Sample/Transfer Tower	1.73	0.02	0.01	0.00				Yes
	Stacker/Reclaimer Stockout	1.73	1.73	0.82	0.12				Yes
	Stacker/Reclaimer Reclaim	1.73	0.02	0.01	0.00				Yes
	Conveyor to Crusher Tower	1.73	1.73	0.82	0.12				Yes
	Conveyor to Transfer Tower	1.73	0.02	0.01	0.00				Yes
	Silos (12 total)	20.82	0.21	0.10	0.01				Yes
				0.01					
	Material Transfer - Pet Coke								
	Front end loading	1.73	1.73	0.82	0.12				Yes
	Hopper loading	1.73	1.73	0.82	0.12				Yes
	Conveyor Transfer	1.73	0.02	0.01	0.00				Yes
	Material Transfer - Limestone								
	Truck unloading to limestone pile	0.13	0.13	0.06	0.01				No
	Emergency limestone reclaim hopper loading	0.13	0.13	0.06	0.01				No
	Limestone platform conveyor drop to crusher Fe	0.13	1.32E-03	6.25E-04	9.46E-05				No
	Emergency Limestone reclaim hopper drop to et	0.13	1.32E-03	6.25E-04	9.46E-05				No
	Limestone drop to crusher house and overland c	0.13	0.13	0.06	0.01				No
	Limestone emergency reclaim conveyor drop to	0.13	1.32E-03	6.25E-04	9.46E-05				No
	Limestone overland conveyor drop to cross con	0.13	1.32E-03	6.25E-04	9.46E-05				No
	Limestone cross conveyor drop to Limestone Si	0.13	1.32E-03	6.25E-04	9.46E-05				No
	Limestone overland conveyor drop to Limestone	0.13	1.32E-03	6.25E-04	9.46E-05				No
	Material Transfer - Gypsum								No
	Conveyor to stockout	0.25	2.54E-01	1.20E-01	1.82E-02				No
	Truck loading	0.25	2.54E-01	1.20E-01	1.82E-02				
	Material Transfer - Fly Ash								
	Truck loadout 1	1.08	1.08E-02	5.11E-03	7.73E-04				Yes
	Truck loadout 2	1.08	1.08E-02	5.11E-03	7.73E-04				Yes
	Silo 1	1.08	1.08E-02	5.11E-03	7.73E-04				Yes
	Silo 2	1.08	1.08E-02	5.11E-03	7.73E-04				Yes
	Material Transfer - Bottom Ash								
	Bottom Ash Transfer Point	0.32	3.17E-01	1.50E-01	2.27E-02				No
Crusher	Coal Crusher	58.5	0.59	0.23	-				Yes
	Limestone Crusher	4.875	0.05	0.02	-				Yes
Storage Piles	Limestone Storage Pile	7.94E-02	7.94E-02	4.76E-02	0.00E+00				No
	Gypsum Storage Pile	1.65E+00	1.65E+00	9.91E-01	0.00E+00				Yes
	Coal Storage Pile	1.83E+00	1.83E+00	1.10E+00	0.00E+00				Yes
	Petcoke Storage Pile	8.58E-01	8.58E-01	5.15E-01	0.00E+00				No
Tanks	Fuel Oil Tank #2				Emit VOC Only				Yes
	Lubricating Oil Tank 3				Emit VOC Only				Yes
	Lubricating Oil Tank 4				Emit VOC Only				Yes
Cooling Towers	Cooling Towers	9.32	9.32	9.32	9.32				Yes

Figure A-1. Property Line
Pee Dee Facility



Edge markings shown in Universal Transverse Mercator Coordinates, Zone 17, NAD27

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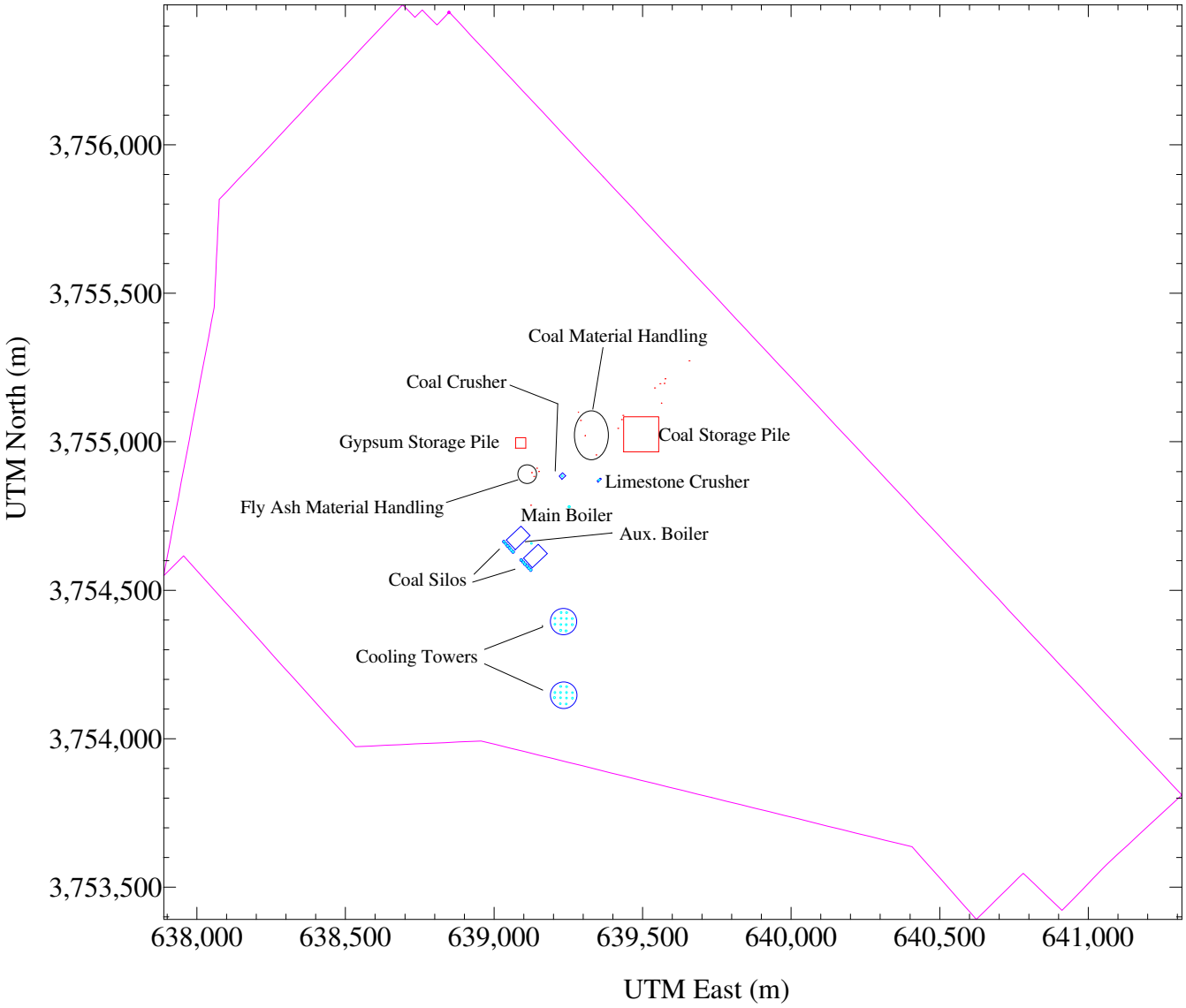
051101.0107
Property Line.srf

Figure A-2. Building Layout and Fenceline
Pee Dee Facility



Edge markings shown in Universal Transverse Mercator Coordinates, Zone 17, NAD27

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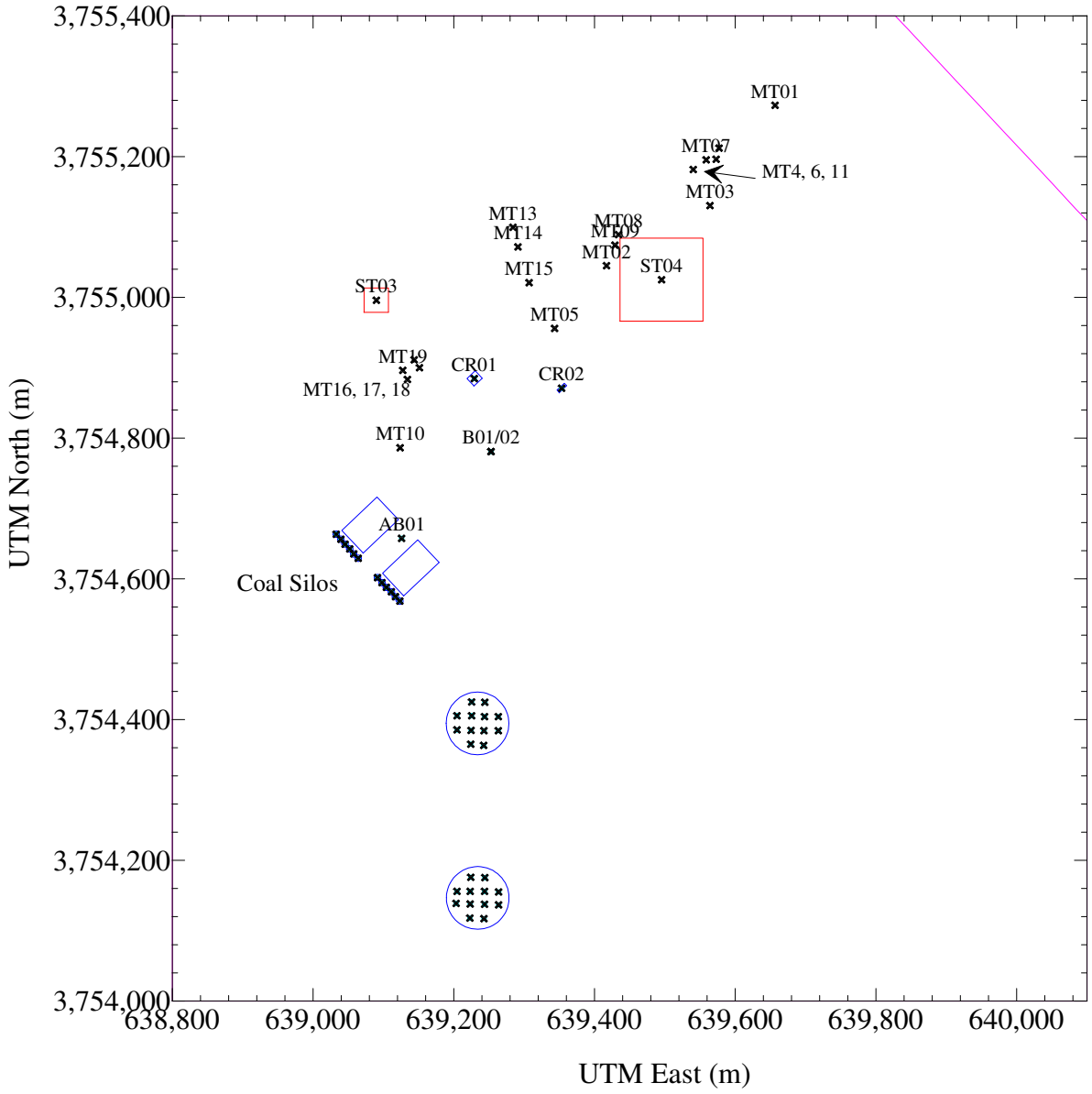
051101.0107
SiteLayout.srf

Figure A-3. Emission Points
Pee Dee Facility



Edge markings shown in Universal Transverse Mercator Coordinates, Zone 17, NAD27

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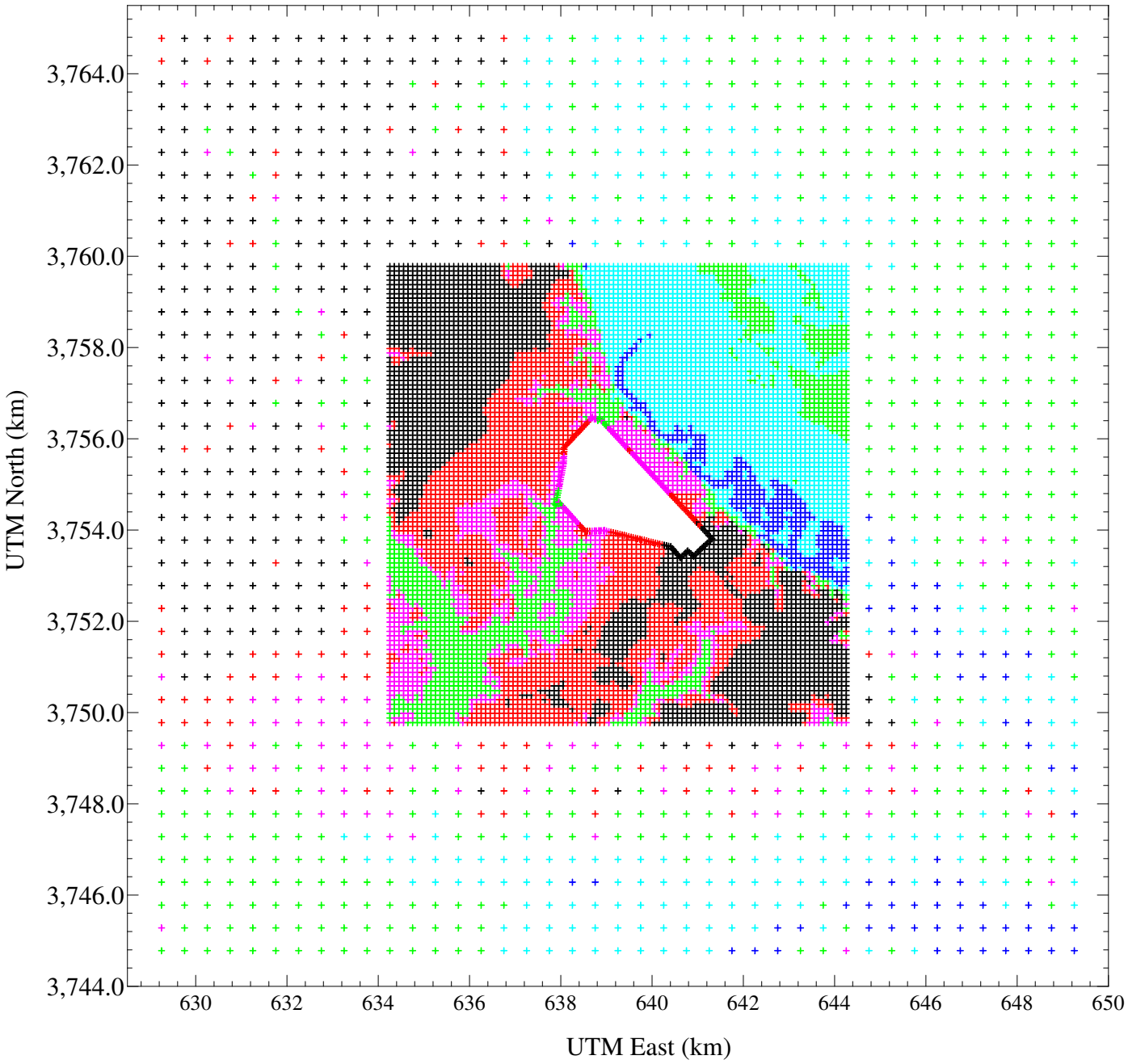
051101.0107
SiteLayout with Emission Points.srf

Figure A-4. 10km Receptor Grid
Pee Dee Facility



Edge markings shown in Universal Transverse Mercator Coordinates, Zone 17, NAD27

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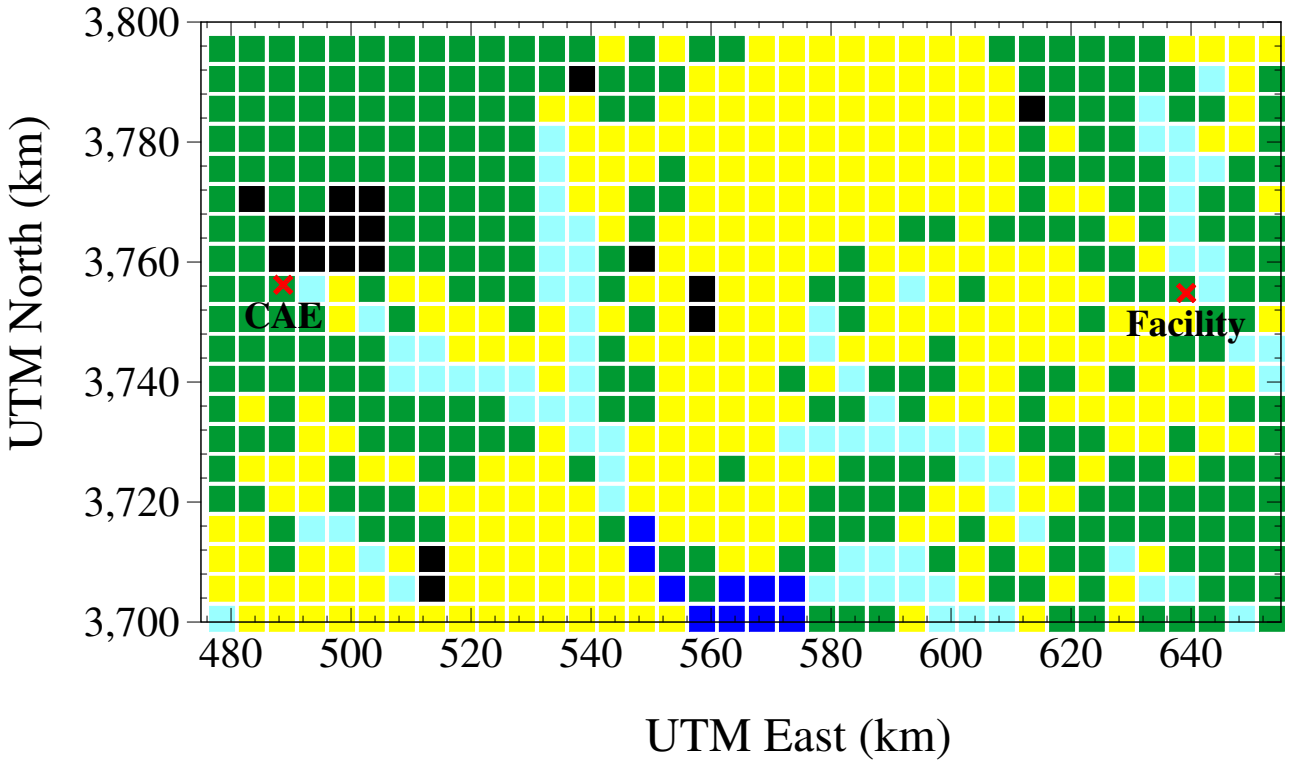
051101.0107
10km Receptors.srf

- 2 to 7 m
- 7 to 10 m
- 10 to 18 m
- 18 to 20 m
- 20 to 22 m
- 22 to 30 m

Figure A-5. Landuse Plot
Pee Dee Facility



Edge markings shown in Universal Transverse Mercator Coordinates, Zone 17, NAD27

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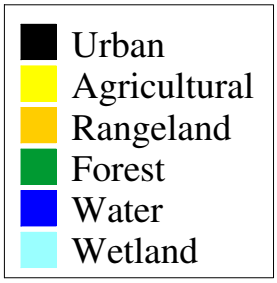
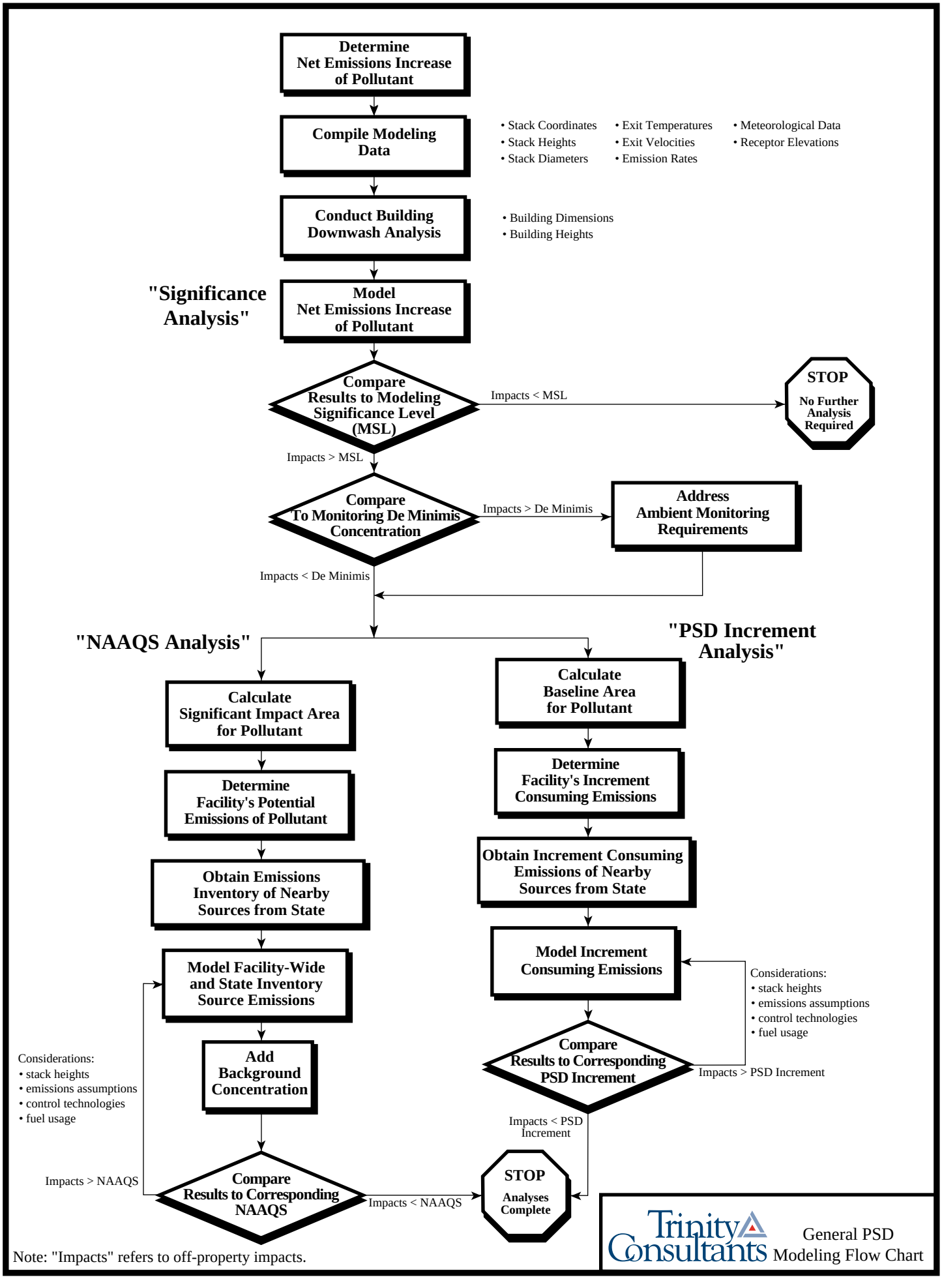
AERMOD Landuse.srf



ATTACHMENT 2

General PSD Modeling Flowchart


Determine Net Emissions Increase of Pollutant
Compile Modeling Data
• Stack Coordinates
• Stack Heights
• Stack Diameters
• Exit Temperatures
• Exit Velocities
• Emission Rates
• Meteorological Data
• Receptor Elevations
Conduct Building Downwash Analysis
• Building Dimensions
• Building Heights
"Significance Analysis"
Model Net Emissions Increase of Pollutant
Compare Results to Modeling Significance Level (MSL)
Impacts < MSL
STOP
No Further Analysis Required
Impacts > MSL
Compare To Monitoring De Minimis Concentration
Impacts > De Minimis
Address Ambient Monitoring Requirements
Impacts < De Minimis
"NAAQS Analysis"
"PSD Increment Analysis"
Calculate Significant Impact Area for Pollutant
Determine Facility's Potential Emissions of Pollutant
Obtain Emissions Inventory of Nearby Sources from State
Model Facility-Wide and State Inventory Source Emissions
Add Background Concentration
Considerations:
• stack heights
• emissions assumptions
• control technologies
• fuel usage
Impacts > NAAQS
Compare Results to Corresponding NAAQS
Impacts < NAAQS
STOP
Analyses Complete
Calculate Baseline Area for Pollutant
Determine Facility's Increment Consuming Emissions
Obtain Increment Consuming Emissions of Nearby Sources from State
Model Increment Consuming Emissions
Considerations:
• stack heights
• emissions assumptions
• control technologies
• fuel usage
Compare Results to Corresponding PSD Increment
Impacts > PSD Increment
Impacts < PSD Increment
Note: "Impacts" refers to off-property impacts.
Trinity Consultants
General PSD Modeling Flow Chart